

Brooklyn-Queens Aquifer

FEASIBILITY STUDY UPDATE

City of New York
Department of Environmental Protection



Michael R. Bloomberg, Mayor
Christopher O. Ward, Commissioner

BQA Study Produces First Wave of Results

In August 2002, the New York City Department of Environmental Protection's (DEP) Brooklyn-Queens Aquifer Feasibility Study was introduced to the community in a brief newsletter that described the project's goals and initial activities. Since that time, a great deal has happened to move the project forward. We have completed successful pilot testing of groundwater treatment at

Station 6. Our Citizens Advisory Committee (CAC) remains active in all aspects of the study and has selected a panel of distinguished scientists in the areas of environmental engineering and public health to independently guide its efforts.

In addition, significant steps have been taken, in cooperation with the New York State Department of Environmental Conservation (DEC), to clean up the

West Side Corporation (WSC) state **superfund** site, which has been of great concern to the community for many years. As our project team prepares to start the next phase of work, this newsletter will bring you up-to-date on the activities of the past year and will hopefully encourage you to become involved in future phases of the project.

Testing the Waters

Station 6 Pilot Program Shows Sparkling Results

In February 2003, DEP's Station 6 Pilot Plant, located at 108th Avenue and 165th Place, closed its doors after a successful year-long program to test several alternative water treatment technologies. The goal of the project was to determine the most effective means of removing iron and manganese and "softening" **groundwater** in order to supply high quality drinking water to the residents of southeast Queens. All of the methods tested showed impressive results by reducing the targeted parameters to well below state and federal drinking water standards and removing calcium carbonate and other mineral salts that naturally cause hardness in water.

The first step considered in preparing the water for iron and manganese

removal was pH adjustment. A measurement of the "basic" or "acidic" condition of a liquid, a higher pH represents water that is less acidic. While the pilot

program examined several ways to raise the pH of the groundwater (which is low due to the natural interaction of water and minerals), it was determined that

chemical addition was not needed to achieve excellent removal of iron and manganese.

The removal of iron and manganese, which are metals naturally found in groundwater, required a two-step process: *oxidation* (adding oxygen-containing compounds) to create particles large enough to be filtered out, and *filtration* of the iron and manganese particles. Although they are non-toxic, iron and manganese affect the color, and to a lesser extent, the taste of water and can stain plumbing fixtures and laundry. The pilot program tested two alternative oxidation techniques. The first involved adding potassium permanganate, a chemical that is widely used throughout the world to facilitate the removal of iron and manganese. The second is a process that merely adds ozone, a



Karim Naraghi, Malcolm Pirnie, Inc. displays treated Station 6 Pilot Plant water.

Testing the Waters (continued)

Aquifer: A natural underground layer, often of sand or gravel, which contains water.

Filtration: A process that removes solids from water or gases by passing them through a screen or filter.

Groundwater: The supply of water found beneath the earth's surface, usually in aquifers, which feeds wells and springs.

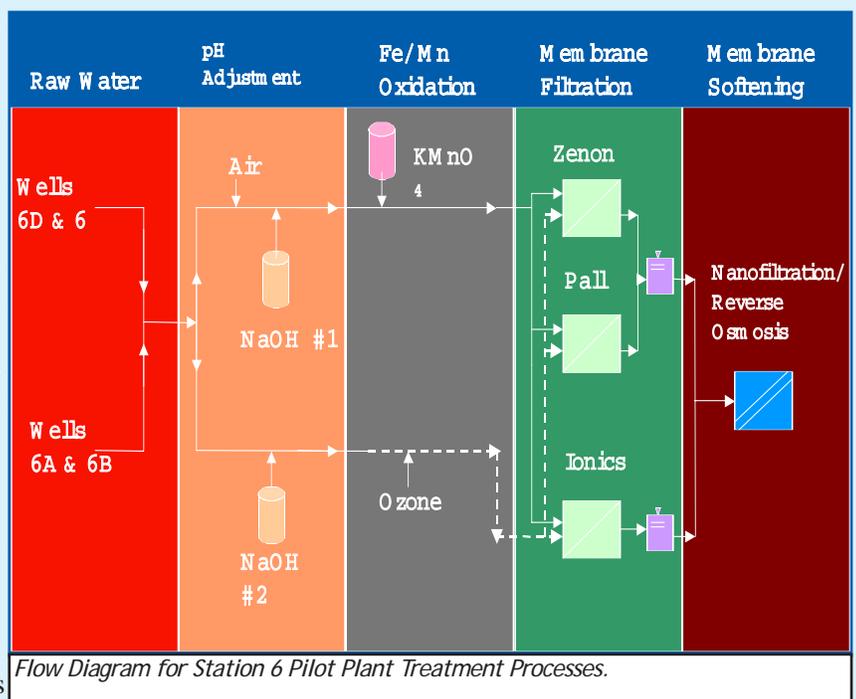
Volatile Organic Compounds (VOCs): Chemicals (including gasoline and cleaning fluids) that evaporate at relatively low temperatures.

form of oxygen, to the water. It is used extensively in Europe for treatment of municipal drinking water supplies and is becoming increasingly popular in the United States. This technique was selected for the BQA project because it is highly effective and requires no chemical addition or pH adjustment.

Once the iron and manganese have been oxidized to form larger particles, a filter must be used to remove the particles from the water. The pilot program tested two types

of membrane filtration: *microfiltration* and *ultrafiltration*, both of which remove oxidized manganese and iron using the same concept as a coffee filter. Unfiltered water is pushed or pulled through a membrane filter. Any iron or manganese particle larger than the pore size of the filter is trapped on the "dirty" side of the membrane filter, while the purified water flows out the other side. Both types of filtration were effective, and an engineering analysis is in progress to determine which option will be used.

The Pilot Plant's final test involved softening of



the groundwater by using membranes to remove calcium carbonate, a non-toxic mineral that occurs naturally in groundwater. The hardness produced by calcium carbonate often leaves a white build-up on plumbing fixtures and cooking pots and can make soap lathering difficult. The pilot program examined two membrane technologies, *nanofiltration* and *reverse osmosis*, to compare their effectiveness in removing the minerals that contribute to hardness. Although other water softening methods are available, they were not considered because they require the use of chemicals. Furthermore, the two techniques tested at the Pilot Plant showed an added benefit of partially removing sodium, nitrates, chlorides, and **volatile organic compounds (VOCs)**, including perchloroethylene (PCE) and methyl tert-butyl ether (MTBE), two contaminants of particular concern to the community.

Since all of the filtration systems tested at Station 6 achieved the goals of the pilot testing program, DEP must now determine which of these technologies will be combined with ozone for use at the Station 6 Demonstration Plant. This decision will be based on an evaluation of overall design and space considerations, equipment size, capital and operational costs, and maintenance requirements. The Demonstration Plant, which will be located at the site of the existing Station 6 facility (Brinkerhoff Avenue and 164th Place), will also incorporate additional technologies to specifically remove VOCs.

Frequently Asked Questions

Will the plant be capable of removing harmful chemicals such as PCE and MTBE from the water?

Yes. The water will be treated to remove these and other VOCs before being softened. VOCs will be removed through the use of Air Stripping, a proven technology. In addition, Pilot Plant testing showed that the water softening filters also remove VOCs, thereby providing an added safety factor.

Will the treatment process reduce sodium levels in the water?

Yes. The water softening membranes will significantly reduce naturally-occurring sodium. Drinking water from the proposed Station 6 plant is expected to contain 30-60 milligrams per liter (mg/L) of sodium. For comparison, the New York State suggested sodium level for people on moderately restricted sodium diets is 270 mg/L.

Will anything be added to the water before it reaches my house?

As with all New York City drinking water, certain compounds will be added to the water supply, including fluoride (for healthy teeth) and additives for disinfection and lead and corrosion control.

Remediation of West Side Corporation Site Is Key To Clean Water

In a project started several years ago, New York State and New York City's environmental agencies have teamed up to clean a hazardous waste site that is a blight on the community and that also poses a potential threat to groundwater supplies.

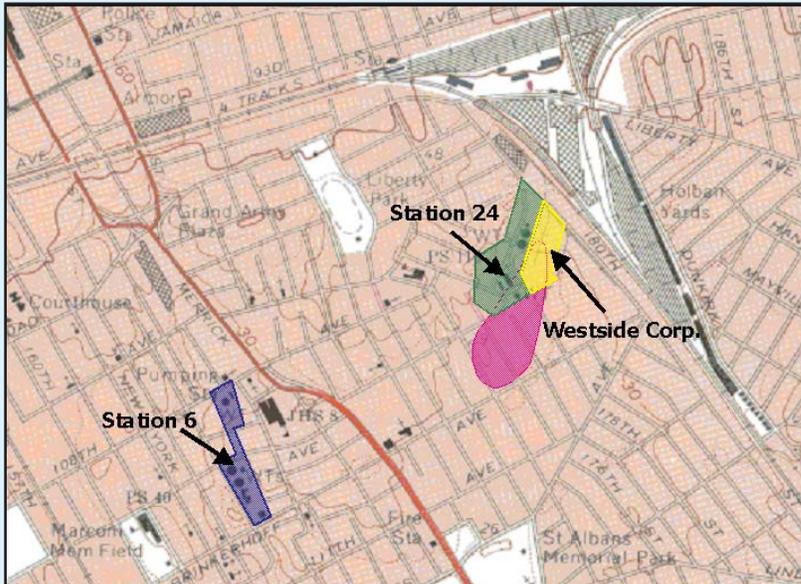
Located at 107-10 180th Street in Jamaica, the West Side Corporation (WSC) was a dry cleaning storage and distribution center that handled large amounts of **PCE** between 1969 and 1982. When the business closed, it left behind a site contaminated by spills and storage tank leaks that had seeped through the soil and into the **aquifer**. Today, a slow-moving **plume** of PCE-contaminated groundwater extends beyond the boundaries of the WSC site.

Working together, DEC and DEP are cleaning up the WSC site by removing contaminated soils and **remediating** contaminated groundwater, before any pumping and treatment of water begins at the Station 6 Demonstration Plant. The clean-up includes the following actions:

1) A high-capacity **recovery well** was installed last summer at DEP's Station 24 facility (180th Street and 106th Road). This well will pump approximately 550 gallons per minute from the contaminated plume, thereby stopping its spread. When the Station 6 Demonstration Plant goes online, a second well will be needed at Station 24 to counteract the draw of groundwater toward the new Station 6 facility. Together, the two recovery wells will pump approximately 1,550 gallons per minute and will eventually eliminate most of the PCE-contaminated groundwater. This water will be treated to meet all applicable standards prior to being discharged into the storm sewer system. It will not be used for drinking water.

2) In order to track the effectiveness of the recovery wells, DEP has also installed six monitoring wells that will measure the quality, depth, and direction of groundwater flow on a continuing basis. These wells were installed at three locations at Station 24 and at three locations in the adjacent neighborhood in the Summer of 2002.

3) DEC will remove PCE from the soil. Because of the depth of the contamination, simple excavation is not an effective option. Instead, **Electrical Resistance Heating (ERH)**, a technique that uses the same principles as a home vaporizer, but on a larger scale, will be used in the most severely contaminated portion of the WSC site. By heating the contaminated soil, vapors are extracted, captured and then destroyed through the use of a catalytic oxidizer, a device similar to a catalytic converter in a car. Any PCE by-products will also be broken down in the process. It is anticipated that the ERH



Location of Station 6, Station 24, WSC, and the PCE-contaminated

process will take three to five months to remediate the most contaminated portion of the WSC site; two other contaminated areas will be cleaned during a subsequent 18-24 month period.

Although the soil clean-up is the responsibility of DEC, DEP Commissioner Christopher Ward has committed city money to fund the effort in order to speed the process and ensure that there are no delays resulting from gaps in state funding. This expedited action will further safeguard the community by preventing contamination from spreading throughout the neighborhood.

With key design and funding components of the clean-up effort in place, work at the site is expected to start shortly. An update on the work will be provided at this Fall's public meeting. (See **Looking Ahead** on back page.)

Electrical Resistance Heating (ERH): A remediation technology that vaporizes contaminants, which are then collected and destroyed.

PCE (also known as PERC): A solvent used primarily in the dry cleaning process.

Plume: A well-defined area of contamination in groundwater that is usually mobile and feather-like in shape.

Recovery Well: A well designed to pump out contaminated groundwater for treatment and disposal.

Remediation: Steps taken to remove contamination from water, air, or soil.

Superfund: Federal and state programs to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Pilot Plant Sparks Interest in Science

Community Members and Students Tour Pilot Plant

"It's so important to raise children to be smart consumers. People need to know where their drinking water comes from, and it's never too early to give them that information."

-Linda Caleb Hazel

"I was impressed with the technology. I've seen the site and I believe that there is a good possibility that it will do what they said it would do."

-Assemblyman William Scarborough

"The process has been a help to the community, and it has given the community, the people who are most directly affected, the opportunity to involve themselves, engage themselves, and inform themselves."

-Councilmember Leroy Comrie

The mysterious processes by which raw groundwater becomes drinking water became crystal clear for children and adults last Winter, as more than 200 students and residents toured the Station 6 Pilot Plant. Inspired by their own visits to the facility last Summer, CAC members Linda Caleb Hazel and Manuel

offs in terms of expanded interest in developing specialized science programs in area schools. With the enthusiastic support of DEP Deputy Commissioner Doug Greeley, Ms. Hazel, Mr. Caughman, and members of the BQA project team met on several occasions with representatives of Queens School District 29, New York



Students from Intermediate School 59 listen as Nicole Brown, Malcolm Pirnie, Inc. explains the Station 6 Pilot Plant groundwater treatment processes.

State Assemblyman William Scarborough and New York City Councilmember Leroy Comrie to explore the possibility of setting up a science lab related to the Station 6 project at I.S. 59. As Ms. Hazel observed, "It's so important to raise children to be smart consumers. People need to know where their drinking water comes from, and it's never too early to give them that information."

Caughman worked with DEP to arrange tours for classes from I.S. 59, senior citizens from St. Albans Congregational Church, and representatives of neighborhood civic organizations. As water churned through the tubes and tanks behind them, Malcolm Pirnie engineers Nicole Brown and Karim Naraghi described the tests being conducted to remove iron and manganese and soften the water.

The plant tours, in turn, produced significant spin-

Frequently Asked Questions

How will the community know if the Demonstration Plant is operating as successfully as the Pilot Plant?

Water produced by the Demonstration Plant will undergo vigorous testing and analysis, the results of which will be reported to the community. The water will never go into the drinking water distribution system if the plant cannot demonstrate that the water produced meets or exceeds all state and federal drinking water standards.

Is any experimental technology being considered for the Station 6 Demonstration Plant?

No. While some methods, such as ozone oxidation, have not been used in New York City, each technique has been used successfully in water systems in the United States and throughout the world.

Making a Difference

Citizens Advisory Committee Plays Vital Role in Project

*"You get a group together that is really working to achieve a goal,
I think it's one of the best things that you could do."*

-CAC Member Manuel Caughman, January 2003

Mr. Caughman's observation was not the overriding sentiment during the Winter of 2001, when DEP began meeting with residents of southeast Queens to discuss the BQA Study. Comments during the first meetings of the CAC reflected the community's mistrust of government and its ability to address local concerns. Echoing the views of their neighbors, residents and elected officials emphasized that they had endured poor drinking water, flooding and a host of other problems over the years. "We were very

exchange of information between the community and DEP and its consultants. CAC members have toured the Station 6 Pilot Plant and received regular briefings on the technologies that were tested; heard updates and detailed information on plans to clean up the WSC site; and provided valuable input and feedback on critical project issues and related community concerns.

One of the CAC's most important tasks has been the selection of an independent Scientific



Donald Cohen, Malcolm Pirnie, Inc. reviews testing results with the CAC and SRP.

Special thanks to Hillside Manor Comprehensive Care Center for use of its facility.

skeptical," conceded Community Board #12 District Manager Yvonne Reddick. But, eighteen months and more than a dozen meetings later, the CAC has developed into a cohesive, vital, working group that still asks the tough questions, but also speaks of the need to reach the broader community with its newfound knowledge.

Composed of community activists and elected officials, the CAC is a central component of the project's outreach program. It has been charged with assisting DEP in conducting the BQA Study by providing guidance and input on water quality, flooding, health and related environmental issues and outreach to groups and individuals throughout the area. Since its first meeting in February 2002, the CAC has been engaged in all aspects of the Study and has fostered the constructive

Review Panel (SRP) to assist the group in evaluating technical information. (See related article on page 7.) Panel members, professors drawn from universities across the region, provide the CAC with a high level of knowledge, as well as the independence to probe deeply into all aspects of the project. The Committee has been pleased with the SRP. As noted by New York City Councilmember Leroy Comrie's representative Jeff Diggs, "This [council] should congratulate itself on the selection of the wide variety of expertise that is represented on the SRP, which was selected...by us!"

The CAC will continue to meet throughout the project, working in close partnership with DEP and the SRP, so that they can assure their neighbors that this time "things will be different."

Citizens Advisory Committee Members

Dr. Canute Bernard
Community Board #12

Dr. Gloria Black
Community Board #12

Tracey Bowes
Community Board #12

Manuel Caughman
Brinkerhoff Action Association

Councilmember Leroy Comrie
New York City Council

Jeff Diggs
Office of Councilmember Leroy Comrie

Kenneth Gill
Addisleigh Park Civic Association

Linda Caleb Hazel
A Better Day/
St. Benedict the Moor/
St. Bonaventure

Richard Hellenbrecht
Chairperson
Community Board #13

Irving Hicks
Brinkerhoff Action Association

Debora Hunte
Brinkerhoff Action Association

Helen Marshall
Queens Borough President

Yvonne Reddick
District Manager
Community Board #12

Peter Richards
Community Board #13

Earl Roberts
113th Precinct Council

Assemblyman William Scarborough
New York State Assembly

State Senator Malcolm A. Smith
New York State Senate

Michael Turner
Resident/Addisleigh Park Civic Association

Say Cheese!

Station 6 Video Captures Pilot Program in Action

"...and we can start to create a constructive relationship for the long-term issues that not only southeast Queens is going to face, but communities all around the City."

**-Christopher O. Ward,
DEP
Commissioner**

The Station 6 Pilot Plant started as an experiment in water treatment, designed to test various methods of producing high quality drinking water. However, it became the story of a public-private partnership that involved citizens, educated schoolchildren and opened the door for wide-ranging discussions about drinking water and public health. In short, it became a story worth telling to a broad audience.

Last Winter, DEP hired filmmaker Rick Meier to record operations at the Pilot Plant. The video, which is currently being finalized, focuses on both the Study's treatment technologies and its public involvement process. As the treatment methodologies are explained, the film features plant tours by school groups and residents, interviews with elected officials and other community leaders, and interaction at CAC meetings.

The purpose of the video is twofold. The first is to educate the public about the technologies involved in turning raw groundwater into high quality drinking water and to show how the Station 6 pilot program successfully used those technologies. The second purpose is to illustrate the importance of community education and active public involvement. As observed by DEP Commissioner Ward in an interview for the video, "People know how we operate and know how we've handled this project. When we confront the next project, they'll understand it. So, building in New York City goes easier and faster. And we can start to create a constructive relationship for the long-term issues that not only southeast Queens is going to face, but communities all around the City."

Right: DEP Commissioner Christopher O. Ward discusses the Station 6 pilot program on the video. Below: Video Title Screen.



Frequently Asked Questions

Will the project help control neighborhood flooding?

Yes, to some extent. By lowering the water table in the area, increased pumping will reduce groundwater flooding of deep basements, the subway tunnel, etc. Generally, surface water flooding will not be affected by the project. However, as a spin-off of the BQA project, DEP has made significant improvements to the drainage system in the vicinity of Station 24. This will help to control neighborhood flooding during storm events.

Does groundwater have any advantages over reservoir water?

While water from the City's reservoir is very clean, there are advantages to using groundwater. Groundwater does not evaporate during a drought and is not exposed to stormwater runoff, which can contain such contaminants as fertilizer or animal waste. As is being demonstrated by the BQA Study, groundwater can be treated to the same health, taste, color, and odor standards as reservoir water.

Scientific Panel Lends Expertise and Credibility to Project

After reviewing dozens of resumes representing a broad range of scientific disciplines, the CAC selected a team of experts to help the group evaluate technical information. Known as the Scientific Review Panel (SRP), the team is composed of seven distinguished professionals with expertise in the fields of civil, environmental, and chemical engineering; hydrogeology; chemistry; public health and risk assessment. The mandate of the SRP, whose members serve on an on-call basis, is to review test results, technical reports and other documents; explain findings to the CAC; provide information on available treatment options; conduct independent sampling and analysis; and participate in CAC meetings.

The SRP has already provided valuable assistance to the Committee through its frank assessment of the plan to remediate the WSC site and by pointedly questioning the project team regarding the Station 24 recovery well and the contaminated underground plume. SRP recommendations for additional monitoring and expanded testing protocols for WSC clean-up have been included in the remediation plan. And after thoroughly reviewing the Technical Memoranda for the Station 6 Pilot Plant, panel members discussed the results with the CAC and project team, shedding light on technical concepts and test results and offering suggestions for presenting the information clearly to the public.



*Top: Dr. Caravanos makes a point at a CAC meeting.
Right: Dr. Rabideau listens to Jeff Diggs at a CAC meeting.*



Scientific Review Panel Members

Dr. Jack Caravanos
Hunter College
School of Health Sciences
(Public Health/Risk Assessment)

Dr. Gilbert Hanson
State University of New York at Stony Brook
Department of Geosciences (Hydrogeology)

Dr. James Kilduff
Rensselaer Polytechnic Institute
Department of Civil and Environmental Engineering (Environmental Engineering)

Dr. Leonard Lion
Cornell University
School of Civil and Environmental Engineering (Environmental Engineering/Chemistry)

Dr. Paul Lioy
University of Medicine and Dentistry of New Jersey
Robert Wood Johnson Medical School
Environmental and Occupational Health Sciences Institute (Public Health/Risk Assessment)

Dr. Alan Rabideau
State University of New York at Buffalo
Department of Civil, Structural and Environmental Engineering (Environmental Engineering/Risk Assessment)

Dr. Dhanonjoy C. Saha
New York Medical College (Public Health)



Dr. Kilduff and Dr. Rabideau tour the Station 6 Pilot Plant.

Looking Ahead

Station 6 Demonstration Plant

After a year of running tests and analyzing data, DEP is taking the next steps toward constructing a Demonstration Plant at Station 6. This plant, a state-of-the-art treatment facility, will incorporate the processes successfully used at the Pilot Plant into a comprehensive program that will include proven technologies for removing VOCs. While construction of the Demonstration Plant is several years and many permits away, the project team's architects and engineers have begun to discuss the plant's form and function in an effort to create a technologically advanced, yet community-friendly facility.

Preliminary discussion of the plant's conceptual design with the CAC has already taken place. This will be followed by a meeting with the facility's residential neighbors to receive their overall input and specific "wish list" and concerns. In the Fall, information about the plant will be discussed at a community-wide meeting, and conceptual designs will be presented to the New York City Art Commission, one of several city agencies responsible for issuing permits for the facility.

West Side Corporation Site Clean-up

Clean-up of the WSC site is about to begin! The first step in remediating contaminated soils at the site is scheduled to start shortly. And plans for groundwater remediation are being finalized and awaiting permitting approval. Detailed information on scheduling and progress at the site will be presented at this Fall's public meeting.

Public Meeting

As noted above, the project team will continue its dialogue with the community at a public meeting this Fall. The meeting will include presentation of the Station 6 Pilot Plant testing results, an update on the WSC clean-up, and a discussion of conceptual plans for the Demonstration Plant. Invitations will be sent to all persons on the BQA mailing list. For further information about the meeting or to be added to the mailing list, contact Helen Neuhaus, Helen Neuhaus & Associates Inc. at (212) 532-4175 or helen@hna1977.com.

Frequently Asked Questions

Will residents of southeast Queens receive groundwater exclusively?

No. Groundwater will continue to be used to supplement existing water supplies, especially in times of drought. Currently, about 80% of the drinking water in southeast Queens comes from the Catskill/Delaware system, the rest from the groundwater system. Even with the proposed Station 6 plant, residents would continue to receive a "blend" of water.

Will the treated groundwater be harder or softer than the current groundwater in the project area? How will it compare with reservoir water?

The treated groundwater from the proposed Station 6 treatment plant will be softer than the current groundwater at Station 6, which has an average hardness of 300 mg/L. Although there is no regulated standard for water hardness, the Pilot Plant demonstrated that it is able to produce water within a target range of 80-100 mg/L. Water from the Catskill/Delaware system has an average of 26 mg/L, which is softer than desirable. Water that is too soft often tastes flat and can corrode pipes and other plumbing fixtures. Water from the Croton system has an average of 92 mg/L.

SAVE THE DATE!

Date: October 22, 2003

Time: 6:30 P.M.

Location: York College
Performing Arts Center
94-45 Guy Brewer Boulevard
Jamaica, NY

Learn about treatment technologies, project schedule, and more. Meet project staff, ask questions, and share your thoughts on the project.

For further information contact:

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or visit our project website at

www.ci.nyc.ny.us/html/dep/html/news/bqa.html